



excellently documented and originates from depths from the continental shelf down to about 800 m. Despite that only a limited geographical area of the northern Arafura Sea was covered, it is unexpectedly rich in specimens (72) and species (20, nine of which are here described as new to science) of Cancellariidae.

Supraspecific taxonomy of Cancellariidae has not yet been worked out satisfactorily and generic allocation of several species discussed here proved to be difficult. Genera of small deep-water cancellariids have been named based on fossil and Recent Australian and New Zealand species. A great confusion prevails, which will be difficult to unravel without reevaluation of the relevant type material and examination of representative collections. Hence, generic names used here may be open to discussion and their usage does not necessarily imply their recognition as the most appropriate name. Therefore, in this paper all genus-level names are treated as genera (no subgenera), and no new generic names are introduced.

## ABBREVIATIONS AND TEXT CONVENTIONS

### *Repositories*

AMS	Australian Museum, Sydney
AMNH	American Museum of Natural History, New York
AV	Author's collection, Mortsel
BMNH	The Natural History Museum, London
DMNH	Delaware Museum of Natural History, Greenville
NZGS	Institute of Geological and Nuclear Sciences, Lower Hutt
KBIN	Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels
MNHN	Muséum national d'Histoire naturelle, Paris
NMW	National Museum of Wales, Cardiff
NSMT	National Science Museum, Tokyo
POLIP	Puslitbang Oseanologi-LIP [Research and Development Centre for Oceanology - Indonesian Institute of Sciences], Jakarta
USNM	National Museum of Natural History, Smithsonian Institution, Washington DC
WAM	Western Australian Museum, Perth
ZMA	Zoologisch Museum, Amsterdam
ZMHU	Museum für Naturkunde, Berlin

### *Other abbreviations*

dd	empty shell
lv	collected alive
spm	specimen (condition at the time of collecting unknown)
OD	original designation
SD	subsequent designation

Counting of protoconch whorls follows VERDUIN (1984). Full references to taxa mentioned in comparisons are listed in PETIT & HARASEWYCH (1990) and are not repeated here.

Paratypes and other reference material are in POLIP as noted under each species. All other material is in MNHN.

## SYSTEMATIC ACCOUNT

Family CANCELLARIIDAE Forbes &amp; Hanley, 1851

Subfamily CANCELLARIINAE

Genus *AXELELLA* Petit, 1988

*Axelella* Petit, 1988: 130 (*nom. nov.* for *Olssonella* Petit, 1970, *non* Glibert & Van de Poel, 1967). Type species (OD): *Cancellaria smithii* Dall, 1888. Recent, Western Atlantic.

Species of *Axelella* are found almost exclusively in central American seas, both Caribbean and Panamic-Pacific. The two species treated here are certainly not typical representatives and are placed in the genus only by lack of a more appropriate genus.

*Axelella kastoroae* sp. nov.

Figs 1-4

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Kai Islands*: stn DW 31, 05°40'S, 132°51'E, 288-289 m, 1 dd.

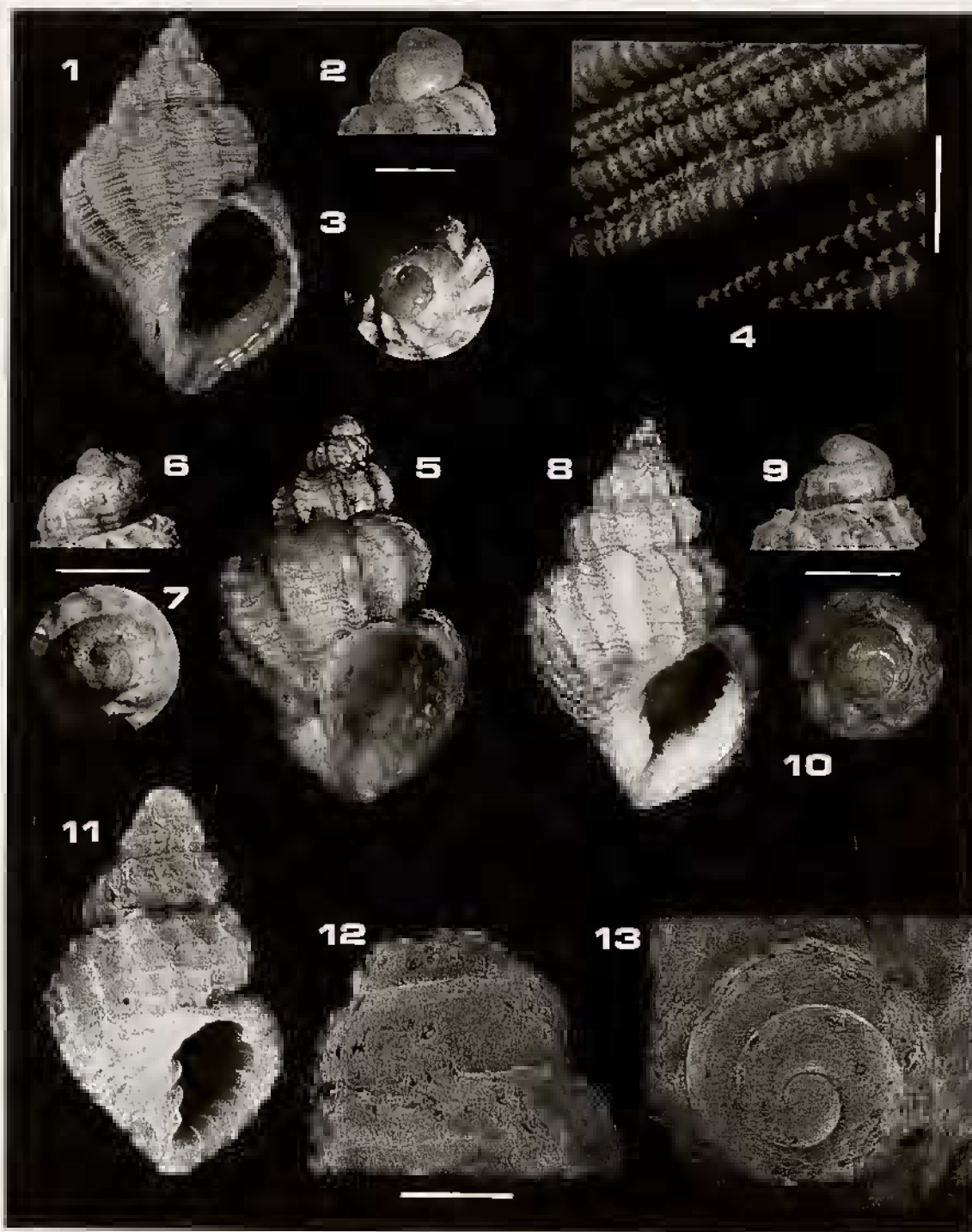
TYPE MATERIAL. — Holotype MNHN.

TYPE LOCALITY. — Indonesia. Off Kai Islands, KARUBAR, stn DW 31, 05°40'S, 132°51'E, 288-289 m.

DESCRIPTION. — *Shell* biconical, with convex whorls and a large aperture. *Protoconch* (Figs 2-3) smooth, paucispiral with 1.0 whorl, maximum diameter 1.0 mm, exposed height 0.7 mm. Transition to *teleoconch* marked only by start of *teleoconch* sculpture. *Teleoconch* with 4 1/4 convex whorls. Axial sculpture of narrow rounded ribs: 12, 12, 13 and 12 on first to fourth whorl respectively, 10 on last whorl. Spiral sculpture of broad flat bands, 6 on first *teleoconch* whorl. From the second whorl on, between the broader bands up to 4 narrower ones occur, all bands fitting closely together. On third and fourth whorl 8 primary bands, plus secondary and tertiary ones. On last whorl up to 60 spirals bands, divided axially by sharp, raised incremental riblets (Fig. 4). Suture impressed, very slightly canaliculate. *Aperture* semicircular, tapering anteriorly into a short siphonal canal oriented slightly abaxially. Columella straight, parallel to shell axis, with three strongly oblique folds, apical one strongest, weak abapical fold near rim of siphonal canal. Outer lip with crenulated edge, 14 lirae inside. Umbilical slit narrow, almost completely closed by columellar callus. Siphonal fasciole present but not strong.

Dimensions: 15.5 x 10.4 mm.

REMARKS. — *Axelella kastoroae* is rather similar to *Cancellaria quasilla* Petit, 1987 (= *Cancellaria cretacea* E. A. Smith, 1899, *non* Nyst, 1881) from off Southern India, Burma, and off Northern Somalia. The apical whorls of the holotype of *C. quasilla* (material examined in the Zoological Survey of India, Calcutta) are strongly eroded, but specimens from off Somalia (AV) have a multispiral protoconch. In spite of a large distance in time and space, *A. kastoroae* also resembles *Cancellaria paraguayensis* H. K. Hodson in HODSON & HODSON, 1931, from the Miocene of Venezuela, as figured by JUNG (1965, pl. 75, figs 15-16). The latter species grows up to 36 mm, has a stronger siphonal fasciole and fewer axials on the last whorl as compared to *A. kastoroae*. HODSON (1931: 44) and JUNG (1965: 555) did not place *C. paraguayensis* in a subgenus and PETIT (1987: 154) compared *C. quasilla* with species of *Merica*, stating that a determination of subgeneric placement was not yet possible. These species, which in my opinion are congeneric, differ from typical *Cancellaria* (*s. s.*) species in lacking the bifid posterior columellar fold. Further, *Axelella kastoroae* differs from species of *Merica* in its much more convex whorls and its broad axial sculpture. The microsculpture of *A. kastoroae* (Fig. 4) resembles that of *Nipponaphera habei* Petit, 1972 (Japan and the Philippines) but is finer; the latter species has a multispiral protoconch and the *teleoconch* whorls are strongly angulate. In general form, the new species also bears some resemblance to



FIGS 1-4. — *Axelella kastoroae* sp. nov.: 1, holotype, 15.5 mm; 2-3, protoconch. Scale bar: 1 mm; 4, detail of teleoconch sculpture. Scale bar: 0.4 mm.

FIGS 5-7. — *Axelella* cf. *nodosivaricosa* (Petuch): 5, 14.9 mm, stn CP 67, 146-233 m; 6-7, protoconch. Scale bar: 1 mm.

FIGS 8-10. — *Bonellitia atopodontia* (Petit & Harasewych): 8, 22.6 mm, stn CP 83, 285-297 m; 9-10, protoconch of Fig. 8. Scale bar: 1 mm.

FIGS 11-13. — *Bonellitia garrardi* (Petit): 11, 7.4 mm, stn DW 49, 206-210 m; 12-13, protoconch of same. Scale bar: 0.5 mm.



*Axelella funiculata* (Hinds, 1843) from western Central America, but that species is more elongated, it has a much more impressed suture and stronger columellar folds, it lacks the sculpture of sharp, raised incremental riblets and it has a multispiral protoconch.

ETYMOLOGY. — Named in honour of Mrs Widana KASTORO (POLIPI).

*Axelella* cf. *nodosivaricosa* (Petuch, 1979)

Figs 5-7

*Agatrix* (*Olssonella*) *nodosivaricosa* Petuch, 1979: 11, 15, figs 26-27.

*Scalptia nodosivaricosa* - SPRINGSTEEN & LEOBRERA, 1986: 334, pl. 95, fig. 10.

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Tanimbar Islands*: stn CP 67, 08°58'S, 132°06'E, 146-233 m, 1 dd.

TYPE MATERIAL. — Holotype (11 x 9 mm), DMNH 126397.

TYPE LOCALITY. — Philippines. Off Balicasag, Bohol Island, 300 m.

DISTRIBUTION. — *A. nodosivaricosa* is known from the Philippines and Japan (AV, KBIN), now possibly extended to the Arafura Sea.

REMARKS. — The rather eroded shell (14.9 x 9.8 mm) is very close to specimens of *A. nodosivaricosa* from the Philippines and Japan (AV, KBIN) but differs from them in having the whorls more inflated, fewer axial ribs on spire whorls (8, 9, 9 vs 14, 13, 9 on second to fourth whorl respectively), and spiral sculpture only weakly indicated. The last adult whorl has 7 axial ribs in both the KARUBAR specimen and typical *A. nodosivaricosa*. The present specimen has a paucispiral protoconch with 1 whorl, maximum diameter 0.9 mm, exposed height 0.7 mm, nucleus diameter 0.4 mm. Typical *A. nodosivaricosa* (KBIN, AV, Figs 60-62) have a protoconch with 1 1/4 to 1 3/4 whorl, maximum diameter 0.95 mm, exposed height 0.8 mm, nucleus diameter 0.3 mm, and this results in rather different general appearance (Figs 6-7 vs Figs 61-62). The main difference resides in the regularly squared cancellation of the earlier whorls in *A. nodosivaricosa*, versus the strong axial sculpture in the present specimen. Since only one rather eroded shell is at hand, it is hard to judge the value of cited differences; therefore this shell is here provisionally identified as conforming *A. nodosivaricosa*.

Genus *BONELLITIA* Jousseaume, 1887

*Bonellitia* Jousseaume, 1887: 223. Type species (OD): *Cancellaria bonellii* Bellardi, 1841. Miocene-Pliocene Italy.

*Admetula* Cossmann, 1889 has been used for species in this genus; for a discussion on these names, see VERHECKEN, 1986: 33.

*Bonellitia atopodonta* (Petit & Harasewych, 1986)

Figs 8-10

*Cancellaria atopodonta* Petit & Harasewych, 1986: 440, figs 5-6.

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Kai Islands*: stn CP 20, 05°15'S, 132°59'E, 769-809 m, 1 dd. — Stn CC 21, 05°14'S, 133°00'E, 688-694 m, 1 lv. — Stn DW 24, 05°32'S, 132°51'E, 230-243 m, 1 dd.

*Tanimbar Islands*: stn CP 38, 07°40'S, 132°27'E, 620-666 m, 1 lv (POLIPI). — Stn CP 59, 08°20'S, 132°11'E, 399-405m, 1 dd (POLIPI). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 7 dd, 1 lv. — Stn CP 70, 08°41'S, 131°47'E, 410-413 m, 2 dd (POLIPI). — Stn CP 72, 08°36'S, 131°33'E, 676-699 m, 1 lv. — Stn CP 77, 08°57'S, 131°27'E, 346-352 m, 1 lv (POLIPI). — Stn CP 78, 09°06'S, 131°24'E, 284-295 m, 1 dd (POLIPI). — Stn CP 83, 09°23'S, 131°00'E, 285-297 m, 1 dd.

Total: 19 specimens; dimensions up to 24.8 x 15.4 mm.

TYPE MATERIAL. — Holotype (21.5 x 13.6 mm) and 2 paratypes MNHN.

TYPE LOCALITY. — Philippines. SSW of Batangas, Luzon, MUSORSTOM 2, stn CP 78, 13°49'N, 120°28'E, 441-510 m.

DISTRIBUTION. — Philippines, now extended to the Arafura Sea, alive in 352-688 m, shells in 243-809 m.

REMARKS. — The protoconch of most specimens is heavily corroded. Fresh shells have a pale fawn periostracum with strong solid hairs, 0.5 mm long, flattened and broadened at base. This species is nearest to *Bonellitia garrardi*, from which it differs by its larger size, sharper sculpture, and paucispiral protoconch (Figs 9-10). *B. garrardi* has more rounded whorls, and lacks the deep suture and distinct shoulder of *B. atopodonta*.

*Bonellitia garrardi* (Petit, 1974)

Figs 11-13

*Cancellaria (Merica) nassoides* Schepman, 1911: 263, pl. 18, fig. 9 (*non* von Koenen, 1889).

*Admetula garrardi* Petit, 1974: 104 (*nom. nov.* for *C. nassoides* Schepman). — GARRARD 1975: 33, fig. 2(10).

*Neadmete nassoides* - HABE, 1961: 435, pl. 23, fig. 5.

*Bonellitia garrardi* - VERHECKEN, 1986: 34, figs 1-2.

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Taninbar Islands*: stn DW 49, 08°00'S, 132°59'E, 206-210 m, 1 dd.

TYPE MATERIAL. — Holotype (16.2 x 10.1 mm) ZMA.

TYPE LOCALITY. — Indonesia. Near Kai Islands, "Siboga", stn 256, 05°26.6'S, 132°32.5'E, 397 m.

DISTRIBUTION. — Japan, Indonesia, and Queensland, Australia (VERHECKEN, 1986: 34); Philippines (USNM, several lots, unpublished).

REMARKS. — The present specimen is small (7.4 x 4.6 mm), slightly worn, and has part of the outer lip broken. Its large, blunt-tipped multispiral protoconch (1 7/8 whorls; maximum diameter 1.0 mm; exposed height 0.6 mm; Figs 12-13) differentiates it from the sympatric *B. atopodonta* and from *B. superstes* Finlay, 1930, from New Zealand, both having a relatively high paucispiral protoconch.

Genus *BROCCHINIA* Jousseaume, 1887

*Brocchinia* Jousseaume, 1887: 221. Type species (SD by SACCO, 1894: 68): *Voluta mitraeformis* Brocchi, 1814 *non* Lamarck, 1811 [= *Brocchinia tauioparva* Sacco, 1894]. Pliocene, Italy.

*Inglisella* Finlay, 1924 [type species (OD): *Ptychotractus pukeuriensis* Suter, 1917, Miocene, New Zealand] may be a synonym. FINLAY (1924: 501) first placed *P. pukeuriensis* provisionally in *Brocchinia* [*sic*], but later proposed the new genus *Inglisella*, differing "in the thin shell, different form of growth, discrepant sculpture, much straighter columella, and rather pronounced posterior notch in the outer lip just at the keel" (FINLAY, 1924: 513).

The KARUBAR species have a solid shell and a columella with rather strong folds; consequently they are here placed in *Brocchinia*.

*Brocchinia fischeri* (A. Adams, 1860)

Figs 14-18, 22-24

*Cancellaria (Merica) fischeri* A. Adams, 1860: 411.

?*Solutosveltia abyssicola* Habe, 1961: 438, pl. 23, fig. 4.

*Merica fischeri* - A. ADAMS, 1868: 368.

"*Cancellaria fischeri*" - HABE, 1961: 437.

*Inglisella fischeri* - GARRARD, 1975: 39, figs 4 (8)-(11).

*Cancellaria (Merica) fischeri* - HABE, 1985: 10, pl. 2, fig. 4.

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn DW 02, 05°47'S, 132°13'E, 209-240 m, 1 dd. — Stn DW 14, 05°18'S, 132°38'E, 245-246 m, 1 lv (POLIPI). — Stn DW 15, 05°17'S, 132°41'E, 212-221 m, 1 lv, 2 dd. — Stn DW 28, 05°31'S, 132°54'E, 448-467 m, 8 dd.

*Tanimbar Islands*: stn DW 49, 08°00'S, 132°59'E, 206-210 m, 1 lv, 2 dd. — Stn DW 50, 07°59'S, 133°02'E, 184-186 m, 1 lv (POLIPI).

Total 16 specimens, dimensions up to 12.8 x 5.4 mm, with up to 6 teleoconch whorls.

TYPE MATERIAL. — *C. fischeri*: Not located. Three shells from the CUMING collection, BMNH 1968419, were considered possible syntypes and figured as such by GARRARD (1975) and HABE (1985). However, the locality "was written in pencil on the reverse of the board, together with the citation for the original description; the front of the board also bears the locality Korea. The only original writing on the board is the label on the front with the name '*Fischeri*, A. Ad' and the initials M.C. on the reverse denoting the origin of the specimens with Hugh Cuming" (K. WAY, *in litt.* viii-1995). This lot is now in the general collection, BMNH, with the label "These specimens had been separated as the types; this is unlikely".

*S. abyssicola*: whereabouts of holotype (7.9 x 4.8 mm) and paratype (6.8 x 4.2 mm) not mentioned by HABE (1961).

TYPE LOCALITY. — *C. fischeri*: "Strait of Corea", 114 m. — *S. abyssicola*: Japan, off Kochi Prefecture, Shikoku, about 150 m.

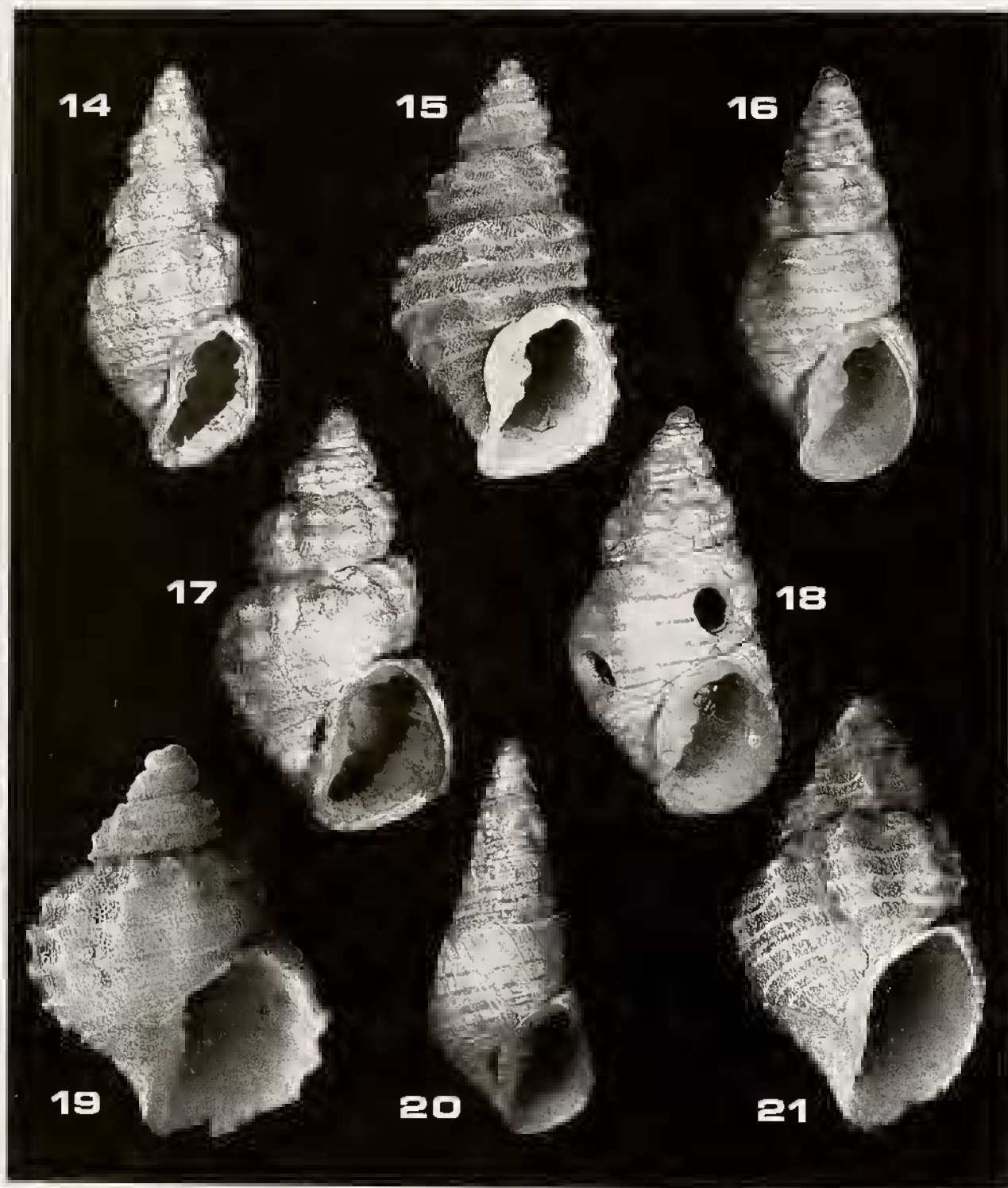
DISTRIBUTION. — Korea; formerly recorded from Japan [A. ADAMS, 1868: 368; and a single specimen each in KBIN, ZMHU, NMW (1955.158.1906), and BMNH], but such records have not been confirmed recently (HABE, 1985: 10); China Sea, off Pratas Island, 234 m (USNM 284939); Philippines (USNM 288372, 289413; said to be from 40 and 1017 m !); Borneo, 622 m (USNM 289966); off South and Western Australia, 79-147 m (GARRARD, 1975: 39).

REMARKS. — *Brocchinia fischeri* has remained little known in the literature. It was omitted by LOEBBECKE (1881-1886), and TRYON (1885: 84) simply mentioned it under the "unfigured and unidentified species of *Cancellaria*". It has only been illustrated by GARRARD (1975) and HABE (1985). *B. fischeri* proves to be rather variable (Figs 14-18), spire angle 36°-41°. Most KARUBAR specimens as well as 8 specimens in AMS show a pitted surface at magnification x 30-60, and SEM pictures show a complex surface with irregularly shaped cavities (Fig. 24). This may represent an intritacalx, an outer shell layer known in Muricidae and several other families, including Cancellariidae (D'ATTILIO & RADWIN, 1971). This microsculpture is practically absent on exposed parts of the shell, such as the spiral cords, and this observation agrees with the softness of intritacalx layers. The fact that a similar pitted layer is also present in related species (*B. kaiensis*, *B. spec. A*, *B. spec. B*) might indicate that this is indeed an intritacalx with possibly taxonomic value, rather than an accidental corrosion present on the teleoconch but not on the protoconch. This type of intritacalx structure has not yet been described in Cancellariidae.

Measurements of intact protoconchs (mean and standard deviation, n = 14): number of whorls, 1.17, 0.24; maximum diameter, 0.74, 0.08 mm; exposed height, 0.59, 0.10 mm.

The name *Solutosveltia abyssicola* is based on shells with an aberrant aperture and may well be a synonym of *B. fischeri*. A shell from KARUBAR: stn DW 28 (Fig. 17) seems to be intermediate between *B. fischeri* and *S. abyssicola* (Fig. 64). The genus *Solutosveltia* is based only on the presence of a semidetached aperture, a character of doubtful taxonomic value.

The elongated form of *Brocchinia fischeri* is similar to that of *B. clenchi* Petit, 1986, from the Atlantic, which has a much weaker sculpture and no pitted shell surface. *B. exigua* (Smith, 1891) from off southeastern Australia has a less constricted suture, lacks the pitted shell surface, has 2 spiral cords per whorl, and only one weak columellar fold.



FIGS 14-18. — *Brocchinia fischeri* (A. Adams), illustration of variability: **14**, 12.8 mm, stn DW 28, 448-467 m; **15**, 6.9 mm, stn DW 28; **16**, 8.2 mm, stn DW 15, 212-221 m; **17**, 10.3 mm, stn DW 28; **18**, 9.8 mm, stn DW 02, 209-240 m.

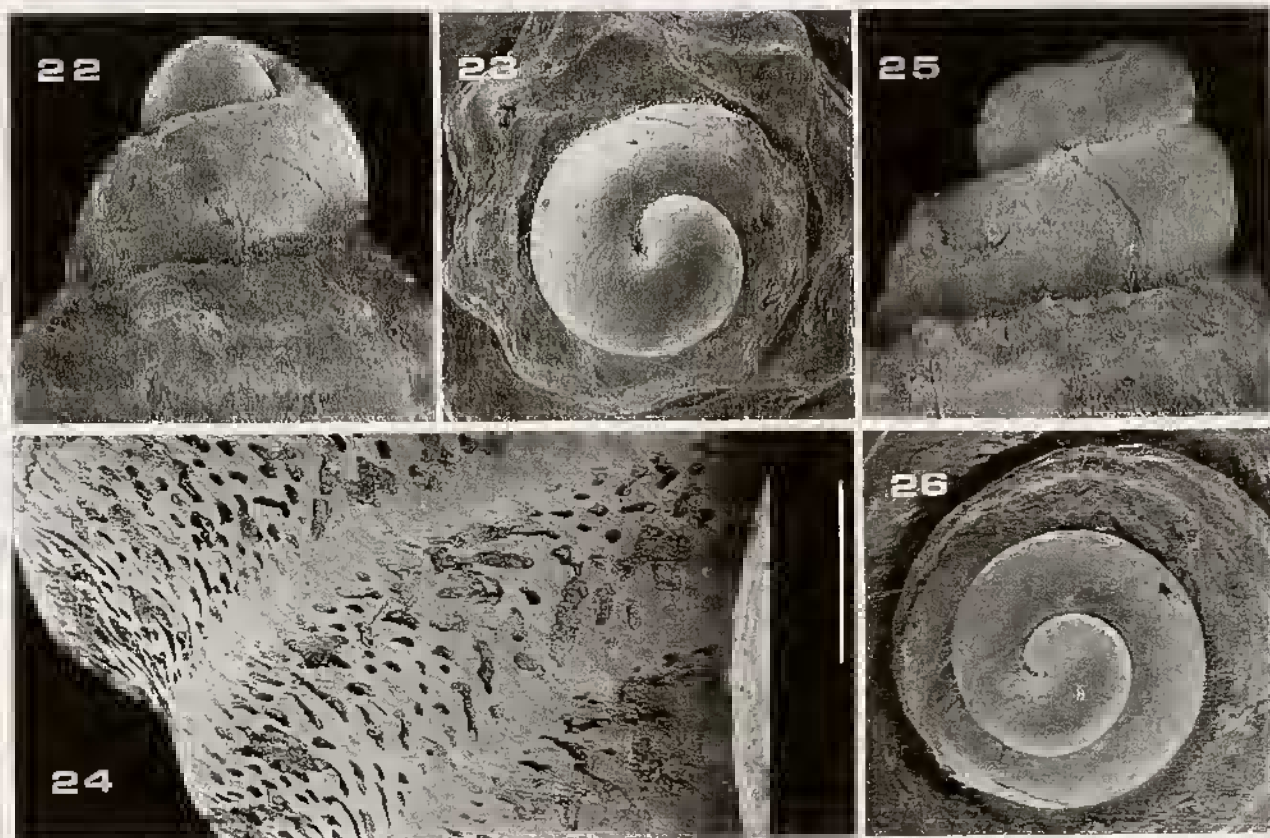
FIG. 19. — *Brocchinia kaiensis* sp. nov., holotype, 4.4 mm.

FIG. 20. — *Brocchinia* spec. A, 9.0 mm, stn DW 15, 212-221 m.

FIG. 21. — *Brocchinia* spec. B, 5.7 mm, stn DW 49, 206-210 m.



*Brocchinia fischeri* belongs to a group of closely related species, occurring both as fossil and Recent in the Pacific from Japan to New Zealand, and also in the Atlantic including Europe, and which have been classified under various generic names. *Brocchinia* was introduced for a European tertiary fossil; *Inglisella* Finlay, 1924, *Anapepta* Finlay, 1930, *Gergovia* Cossmann, 1899, *Microsveltia* Iredale, 1925, *Solutosveltia* Habe, 1961, etc. have been proposed for Indo-Pacific, Australian and New Zealand species.



FIGS 22-24. — *Brocchinia fischeri* (A. Adams), stn DW 49, 206-210 m: 22-23, protoconch; 24, detail of (intritacalx ?) sculpture on last teleoconch whorl. Scale bar: 1 mm.

FIGS 25-26. — *Brocchinia kaiensis* sp. nov., holotype, protoconch. Scale bar: 0.5 mm for both protoconchs.

*Brocchinia kaiensis* sp. nov.

Figs 19, 25-26

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 446-467 m: 1 lv.

TYPE MATERIAL. — Holotype lv, MNHN.

TYPE LOCALITY. — Indonesia. Off Kai Islands. KARUBAR, stn DW 28, 05°31'S, 132°54'E, 446-467 m.

DESCRIPTION. — *Shell* small, globose, spire angle 65°. *Protoconch* paucispiral, somewhat eroded, with about 1.5 whorls with impressed suture, maximum diameter 0.8 mm, exposed height 0.7 mm (Figs 25-26). Transition to teleoconch eroded. *Teleoconch* of about 2 3/4, rapidly expanding whorls. Axial sculpture practically absent on first whorl; 9 indistinct broad rounded ribs on second and last whorls. Spiral sculpture consisting of 3 spiral bands on first two whorls, width about 0.1 mm, remaining equal in strength when crossing over the axial ribs, almost no nodules formed at intersections. Whorls convex, suture lined by a very narrow and shallow canal.

*Aperture* semicircular; outer lip crenulated, no inner lirae, only broad grooves corresponding to spiral bands on outer surface of last whorl. Columella straight, short, with a moderately strong fold and a fainter one forming the rim of the wide siphonal canal. Narrow zone of thin columellar callus; no umbilicus, no siphonal fasciole.

Dimensions: 4.4 x 4.3 mm.

REMARKS. — *B. kaiensis* also has a pitted shell surface between the spiral bands. The general outline is intermediate between *B. tanimbarensis* and *B. fischeri*. From *B. tanimbarensis*, *B. kaiensis* differs by having distinct spiral bands, also in interspaces between axials, no sutural ramp and practically no nodules at intersection of axial and spiral sculpture. *B. fischeri* is much more slender than *B. kaiensis*, its protoconch is more depressed, its columellar folds and callus are much stronger, and it has a parietal tooth.

ETYMOLOGY. — Named after the Indonesian archipelago of the Kai Islands.

### *Brocchinia* spec. A

Figs 20, 27-28

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 15, 05°17'S, 132°41'E, 212-221 m, 1 dd.

DESCRIPTION. — *Shell* high, conical, spire angle 27°, with straight sides and small aperture. *Protoconch* paucispiral with 1 1/4 whorl, nucleus relatively large, whorls smooth and rounded (Figs 27-28), maximum diameter 0.8 mm, exposed height 0.6 mm. Protoconch wider than adapical part of first teleoconch whorl. Transition to teleoconch clearly marked. *Teleoconch* with 5 whorls, the first two with 7 weak, broad axial ribs, subsequent whorls without axial sculpture apart from strongly prosocline growth lines. Spiral sculpture of 3 narrow bands on spire whorls, grouped in abapical two thirds of whorl. Younger whorls flush, suture very slightly grooved. Base with 4 spiral bands getting weaker abapically. Last whorl with 13 spiral bands. Teleoconch surface pitted. *Aperture* rounded, triangular. Outer lip expanded abapically, with 8 strong lirae inside at some distance from edge. Columella short, inclined adaxially, with 2 strong folds and a weaker one at rim of short siphonal canal. One parietal tooth. Columellar callus expanded into a solid but thin-edged columellar collar, half covering a deeply placed umbilical slit.

Dimensions: 9.0 x 3.9 mm.

REMARKS. — This single shell is characterised by its elongated, almost perfectly conical shape, differentiating it from *B. fischeri* with its rather strongly constricted suture. Already the first teleoconch whorl has the characteristic flush shape, versus the more rounded whorls of *B. fischeri*. However, the possibility cannot be excluded that this shell is only an aberrant form of *B. fischeri*: it has columellar folds, callus, and parietal tooth much like it, and the early whorls similarly do have axial sculpture. The loss of axial sculpture might have been caused by some trauma to the mantle. Protoconch dimensions do not allow a distinction to be made. More material will be needed to assess whether or not it is a separate species.

### *Brocchinia* spec. B

Figs 21, 31-32

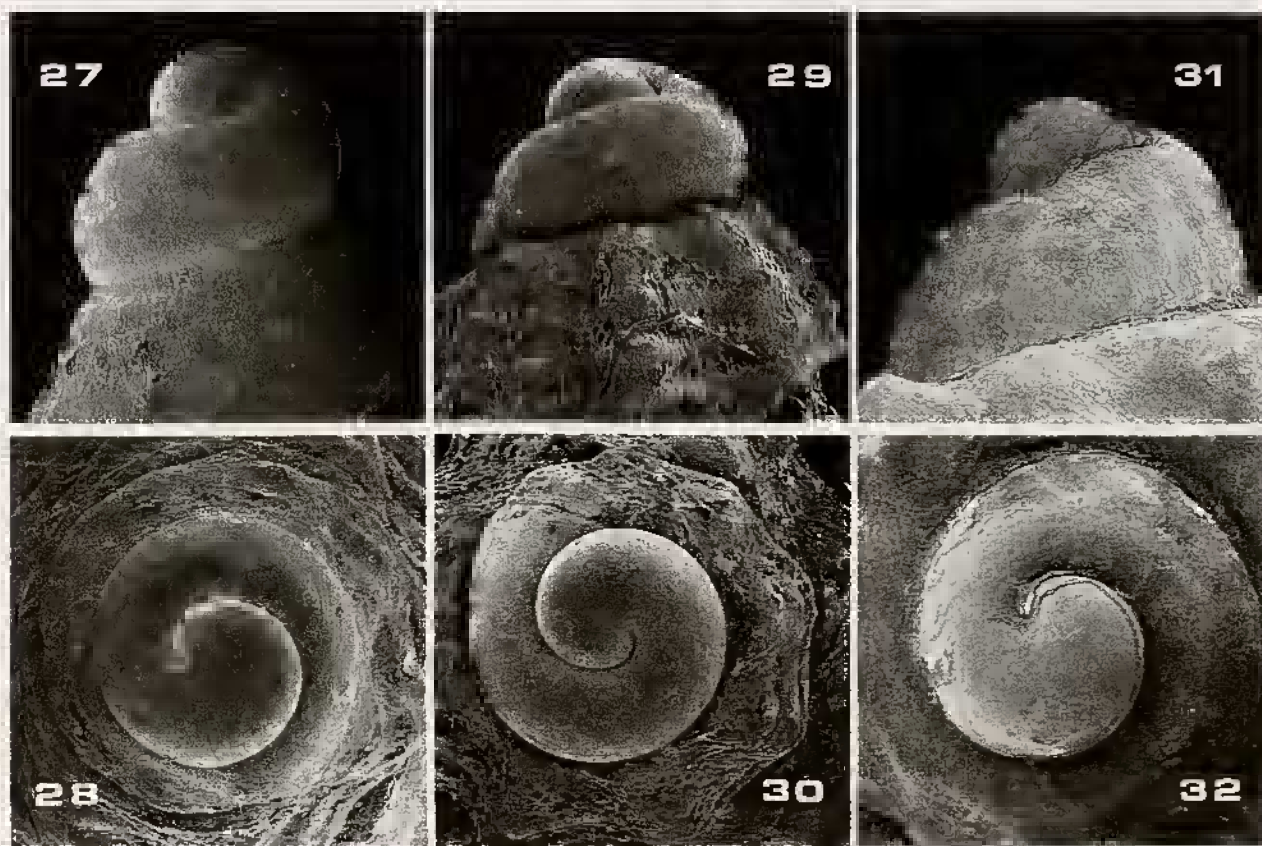
MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn DW 49, 08°00'S, 132°59'E, 206-210 m, 1 lv.

DESCRIPTION. — *Shell* small, elongated, spire angle 53°. *Protoconch* paucispiral, 1 1/4 smooth whorl, maximum diameter 0.8 mm, exposed height 0.6 mm (Figs 29-30). *Teleoconch* with 3.5 whorls, suture impressed with rather narrow groove. Axial sculpture of broadly rounded ribs, 8, 7, 9 on 1st to 3rd whorl. Spiral sculpture consisting on first two whorls of 3 cords, packed together in abapical 2/3 of whorl; on 3rd whorl 4 well-defined spiral cords and a smoothly indicated one in adapical part of whorl; on last half whorl, secondary spirals are formed between the main cords. Fifteen spirals on last whorl behind outer lip. Teleoconch surface pitted.



Aperture elongated oval, outer lip thin, possibly not fully developed. No umbilicus, no siphonal fasciole. Only a narrow zone with thin columellar callus. Columella straight, one faint fold and a very faint one forming the rim of a wide siphonal canal.

Dimensions: 6.1 x 3.5 mm.



FIGS 27-28. — *Brocchinia* spec. A, protoconch.

FIGS 29-30. — *Brocchinia* spec. B, protoconch.

FIGS 31-32. — *Brocchinia tanimbarensis* sp. nov., protoconch of juvenile shell from stn CP 71, 477-480 m.

Scale bar: 0.5 mm for all figures.

REMARKS. — This single shell differs from *B. fischeri* in its broader spire angle, relatively higher aperture, and somewhat less convex whorls. The columellar folds of *B. fischeri* are much stronger and are placed more transversely. This shell can be considered to be subadult, with incompletely formed aperture, but even then the difference in strength of columellar folds still holds. In a specimen of *B. fischeri* (Fig. 18) the columellar folds can be observed through a boring hole in the last whorl and, although not as bold as in a normally formed aperture, they are much sharper than in *Brocchinia* sp. B, where they are very much like those of *B. kaiensis*. The protoconch and the sculpture of the teleoconch, however, are very near that of *B. fischeri*. Therefore, recognition of this single shell as a different species is not straightforward, and more specimens will be needed to confirm it as a separate, undescribed species.

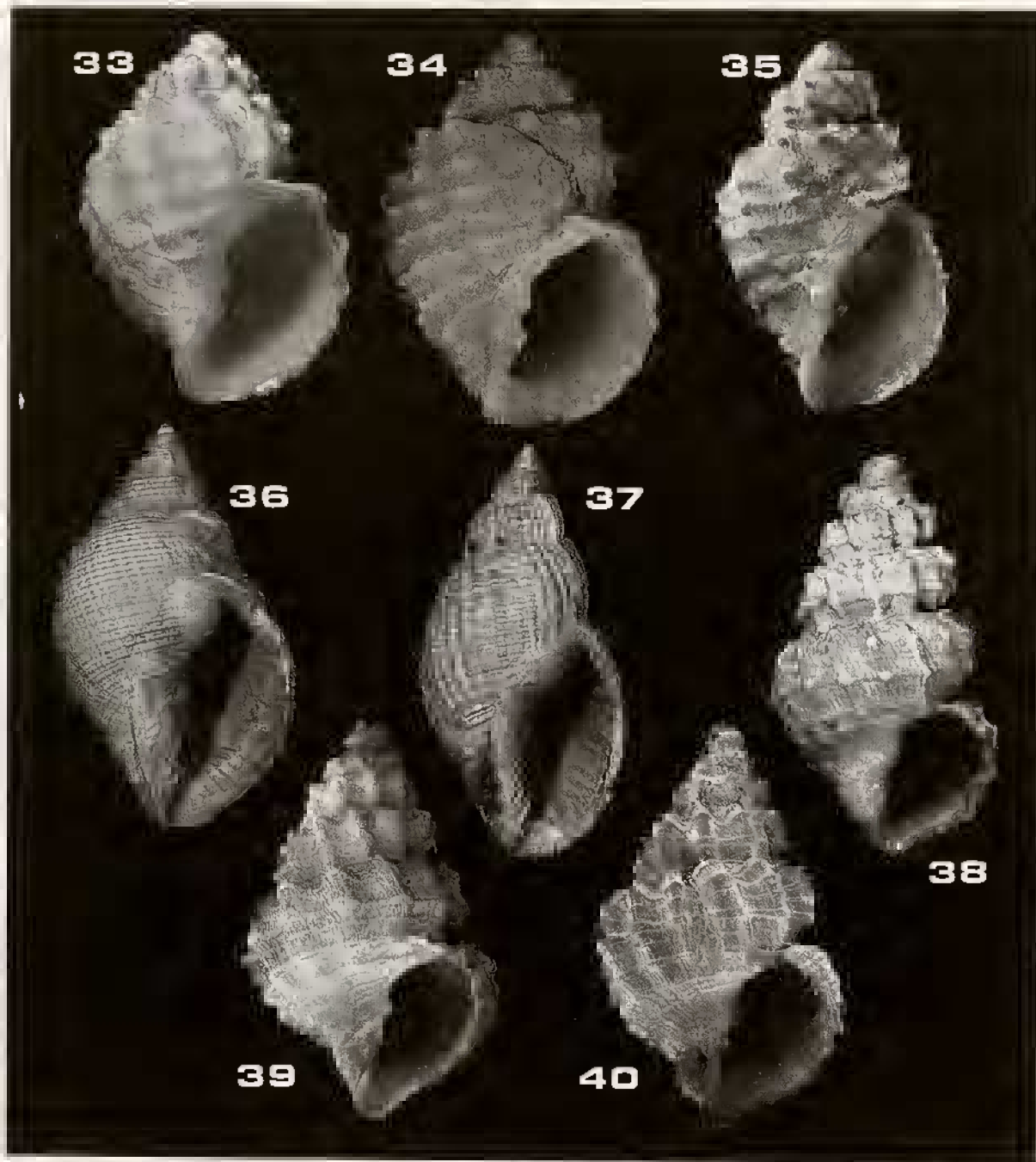
*Brocchinia tanimbarensis* sp. nov.

Figs 31-35

MATERIAL EXAMINED. — **Indonesia**, KARUBAR, *Tanimbar Islands*: stn DW 60, 08°21'S, 132°14'E, 387-389 m, 1 dd (paratype POLIPI). — Stn CP 69, 08°42' S, 131°53' E, 356-368 m, 1 lv (paratype MNHN). — Stn CP 70, 08°41'S,

131°47'E, 410-413 m, 2 lv (paratypes POLIPI). — Stn CP 71, 08°38'S, 131°44'E, 477-480 m, 10 lv, 1 dd (paratypes: 3 POLIPI, 8 MNHN). — Stn CP 77, 08°57'S, 131°27'E, 346-352 m, 1 lv (holotype).

TYPE MATERIAL. — Holotype MNHN. Paratypes: 6 POLIPI, 9 MNHN.



FIGS 33-35. — *Brocchinia tanumbarensis* sp. nov.: 33, holotype, 6.5 mm; 34, 7.4 mm, stn CP 69, 356-368 m; 35, 7.0 mm, stn CP 71, 477-480 m.

FIG. 36. — *Merica elegans* (Sowerby), 30.4 mm, stn CP 65, 174-176 m.

FIG. 37. — *Merica oblonga* (Sowerby), 38.6 mm, stn CP 65, 174-176 m.

FIGS 38-39. — *Microsveltia karubar* sp. nov.: 38, holotype, 9.9 mm; 39, paratype, 7.6 mm, stn CP 71, 477-480 m.

FIG. 40. — *Microsveltia metivieri* sp. nov., holotype, 6.3 mm.



TYPE LOCALITY. — Indonesia. Off Tanimbar Islands, KARUBAR, stn CP 77, 08°57'S, 131°27'E, 346-352 m.

DISTRIBUTION. — Known only from off the Tanimbar Islands.

DESCRIPTION. — *Shell* small, solid, white, with short spire, spire angle 60-80°. *Protoconch* (strongly eroded on most shells, preserved only on the smallest one but already with corroded surface, Figs 31-32) paucispiral with 3/4 whorl, surface sculpture etched, maximum diameter 0.9 mm, exposed height 0.6 mm, transition to teleoconch indistinct. Possibly, a quarter whorl with only smooth sculpture of 2 spiral lines may also be part of the protoconch. *Teleoconch* with up to about 3 1/8 whorls. Sculpture starts on the first teleoconch whorl with 3 smoothly indicated spiral lines, undulating to form 8 gradually stronger nodules. Three spirals on spire whorls, 6 on last whorl. Axial sculpture of broad rounded ribs, 10 and 11 on second and third whorl, 13 on last whorl. Shell sculpture prominent at intersection of axials and spirals, forming strong raised rounded nodules. Whorls with a flat narrow sutural shelf. *Aperture* semicircular, columella parallel to shell axis, with two rather strong folds, the weaker abapical fold on the rim of broad short siphonal canal. Outer lip thin, wavy because of nodulose sculpture, no inner lirae. Thin white columellar callus; no umbilicus nor siphonal fasciole.

Dimensions: holotype 6.5 x 5.5 mm; paratypes up to 7.4 mm.

REMARKS. — None of these specimens has a pitted shell surface like *B. fischeri*, but most of them have sporadic remains of a soft white layer, possibly an intritacalx. The Recent *Oamaruia deleta* Finlay, 1930, of which only the juvenile holotype has been figured, reaches 11 mm and has 3 distinct columellar folds, the lowest being stronger (POWELL, 1979: 224). It may be the closest living relative of *B. tanimbarensis*. *Oamaruia major* Marwick, 1965, from the Opoitian (Pliocene, Piacenzan) of New Zealand is also rather close to *B. tanimbarensis* but differs by its size up to 11.3 mm, its sculpture with only 2 spirals on spire, its more elongate aperture and 3 columellar folds. The New Zealand Miocene *Admete suteri* Marshall & Murdoch, 1920, type species (OD) of *Oamaruia* Finlay, 1924, has a protoconch of two whorls, "the apex obliquely disposed", 17-21 axials on the last whorl, and also has 3 columellar folds. *Waipaoa marwicki* Dell, 1956, from off New Zealand, depth about 600 m, in general form resembles small specimens of *B. tanimbarensis*, but lacks the columellar folds and the nodulose sculpture. *B. tanimbarensis* is rather different from *B. fischeri* and the closely related *B. exigua* from New South Wales, that share with it the general form of the aperture and columella, but lack the strong nodulose sculpture and are much more elongate. *B. tanimbarensis* resembles closely the Atlantic species *B. nodosa* (Verrill & Smith in VERRILL, 1885) and *B. azorica* (Bouchet & Warén, 1985). *B. nodosa* is much larger (up to 16 mm: MNHN specimen from Bay of Biscay), and also *B. azorica* may grow somewhat larger. *B. nodosa* and *B. azorica* differ from *B. tanimbarensis* in having no distinct sutural ramp, the nodules more pointed, and the columellar and parietal callus thicker so that the underlying sculpture is barely visible. *B. pustulosa* Verhecken, 1991a, from off Brazil, 637 m, has a sutural area comparable to that of the new species, grows up to 11.6 mm high, and has a much higher spire.

ETYMOLOGY. — Named after the Indonesian archipelago of the Tanimbar Islands.

#### Genus *MERICA* H. & A. Adams, 1854

*Merica* H. & A. Adams, 1854: 277. Type species (SD by COSSMANN, 1899: 13): *Cancellaria melanostoma* Sowerby, 1849. North-western Indian Ocean.

The two species of *Merica* from the KARUBAR expedition were taken dead at the same station; they may have been carried down from more shallow depths.

#### *Merica elegans* (Sowerby, 1822)

Fig. 36

*Cancellaria elegans* Sowerby, 1822: fig. 3.

*Cancellaria reeveana* Crosse, 1861: 237 (unnecessary name change: VERHECKEN, 1986: 39). — LOEBBECKE, 1881: 12, pl. 2, figs 1-2, 4-6.

*Merica elegans* - VERHECKEN, 1986: 40, fig. 9.

Not *Cancellaria (Merica) elegans* - GARRARD, 1975: 3, fig. 1(1).

**MATERIAL EXAMINED.** — **Indonesia.** KARUBAR, *Tanimbar Island*: stn CP 65, 09°14'S, 132°27'E, 174-176 m, 1 dd.

**TYPE MATERIAL.** — A confusion about the "type lot" of this species asks for some explanation. The shell figured by SOWERBY was "in Mrs. Mawe's collection", but no shell in BMNH has a label indicating that origin. GARRARD (1975: 4) mentioned "Holotype unknown. ... Location of type: BMNH. Not located at present" and I (VERHECKEN, 1986: 40) myself stated "there is no indication that this specimen is, or should be, in BMNH". However, PETIT & HARASEWYCH (1986: 442) mention a type lot BMNH 1968387 of 3 specimens, "labeled *C. elegans*, Baclayon, Bohol Id., Philippines on the back of an old board", stating that "it is possible that two specimens with locality data were added later, as only one specimen has an old label with the number '4', the same sort as used by SOWERBY, glued inside the aperture". About 15 years ago one of these 3 shells was labelled "Awaiting neotype selection by Petit", a designation which has never been published. Furthermore, SOWERBY's figure has the number "3", not "4". This material has now been checked again (vi-1995) and discussed with K. WAY (BMNH). Of the 3 shells, the one (33.6 x 22.7 mm) once intended for neotype selection resembles best but is broader than SOWERBY's figure (33.5 x 20.8 mm), and shows no traces of a label having been glued inside the aperture, although there is an old label with the species name in SOWERBY's handwriting (*vide* K. WAY). That shell now has a label "Although there is no evidence that this specimen reached Cuming via Mrs. Mawe; its very close similarity to the type figure and Sowerby's own hand on the label must make it eligible to be considered as a possible type. K. WAY, 1986". Since there is no solid proof that this is the figured shell, its designation as lectotype would pose a problem; and because it has no reliable locality data, it does not qualify for selection as a neotype. I suggest the best solution would be to select as neotype a well documented shell resembling as closely as possible this BMNH shell, when such specimen can be found.

**TYPE LOCALITY.** — Unknown to SOWERBY (I). Ticao, Philippines, according to G. B. SOWERBY (II) (1849: 447), possibly based on 4 shells *ex* Mrs DE BURGH coll. (BMNH).

**DISTRIBUTION.** — Philippines; Indonesia.

**REMARKS.** — Within the genus *Merica*, *M. elegans* is characterised by its numerous weak prosocline ribs, only very slightly canaliculate suture, and slightly inflated fusiform outline. The present specimen (30.4 x 18.8 mm) is more slender than *Merica melanostoma* Sowerby, 1849, and *M. subsinensis* Loebbecke, 1881. Its suture is less canaliculate, and its sculpture is dominantly spiral, much more like that of *Merica sinensis* Reeve, 1856, which however has a strongly oblique protoconch. The species described and illustrated by GARRARD [1975: 3, fig. 1(1)] as *Cancellaria (Merica) elegans* and occurring subtidally down to 49 m off NE Australia (including Gulf of Carpenteria, near the Arafura Sea) to Queensland, differs markedly from the present material.

### *Merica oblonga* (Sowerby, 1825)

Fig. 37

*Cancellaria oblonga* Sowerby, 1825: Appendix p. xv. — SOWERBY 1832: fig. 19.

*Cancellaria bifasciata* Deshayes, 1830: 181. — LOEBBECKE, 1885: 30, pl. 9, figs 1-2.

*Merica bifasciata* - HABE, 1961: 434, pl. 24, fig. 27.

*Merica oblonga* - CHENU, 1859: 277, fig. 1847. — PETIT, 1974: 112, fig. 5. — VERHECKEN, 1986: 41, figs 7-8.

**MATERIAL EXAMINED.** — **Indonesia.** KARUBAR, *Tanimbar Islands*: stn CP 65, 09°14'S, 132°27'E, 174-176 m, 2 dd (38.6 x 19.2 mm; 35.1 x 17.2 mm).

**TYPE MATERIAL.** — *C. oblonga*: SOWERBY's shell from the Tankerville auction has not been located (not in BMNH). — *C. bifasciata*: holotype (21.4 x 11.8 mm) in MNHN.

TYPE LOCALITY. — *C. oblonga*: Unknown. KIENER (1841: 6) indicated "l'océan équinoxial, les côtes de Panama", which is erroneous (KEEN, 1971: 649). SOWERBY (II) (1849: 447) first mentioned a correct locality: "Straits of Macassar". — *C. bifasciata*: Unknown.

DISTRIBUTION. — Japan to Indonesia; Northern Indian Ocean to Aden; Eastern South Africa (?) (VERHECKEN, 1986: 41; VERHECKEN & WRANIK, 1991: 60).

REMARKS. — Specimens in collections are usually smaller in size [heights of 43 mm (Loebbecke Museum und Aquarium, Düsseldorf) and 37 mm (VERHECKEN, 1986: 42) are exceptional] and have a much smoother sculpture. The coarse sculpture of present specimens resembles that of *Merica laddi* Petit, 1987 [= *Cancellaria (Merica) petiti* Ladd, 1982, *non* Olsson, 1967], from the Pliocene of Fiji, which is smaller and has a more acuminate spire.

### Genus *MICROSVELTIA* Iredale, 1925

*Microsveltia* Iredale, 1925: 265. Type species (OD): *Microsveltia recessa* Iredale, 1925. Recent, New South Wales, Australia.

GARRARD (1975: 35) considers *Microsveltia* a synonym of *Gergovia* Cossmann, 1899, because *Cancellaria platypleura* Tate, 1898, type species (OD) of *Gergovia* "was almost certainly ancestral [to *M. recessa*], and the introduction of a new genus was unwarranted". However, COSSMANN originally included *Gergovia* in *Merica* as a new section; and *M. recessa* has very little resemblance to any species of *Merica*. Hence, this synonymy is not accepted here, and *Microsveltia* is considered valid. FITZLAY (1930: 241) considered *Microsveltia* to be "an absolute synonym" of *Inglisella*; but the *Brocchinia*-like species included in *Inglisella* do not seem closely related to *M. recessa*. Inclusion of the following four species in *Microsveltia* is only provisional, awaiting a thorough revision of the cancellariid genera.

### *Microsveltia karubar* sp. nov.

Figs 38-39

MATERIAL EXAMINED. — Indonesia. KARUBAR, Tanimbar Islands; stn CP 71, 08°38'S, 131°44'E, 477-480 m, 3 lv.

TYPE MATERIAL. — Holotype lv, MNHN. Paratypes: 1 lv MNHN, 1 lv POLIPI.

TYPE LOCALITY. — Indonesia. Off Tanimbar Islands, KARUBAR, stn CP 71, 08°38'S, 131°44'E, 477-480 m.

DESCRIPTION. — *Shell* small, with relatively high, conical spire and small aperture, whorls bicarinate, suture well impressed. *Protoconch* (severely corroded in all shells) apparently paucispiral and rather high, not flattened. *Teleoconch* with up to about 5 whorls. Axial sculpture of rather narrow rounded ribs, constricted near suture, numbering 7-10, 9-11, 11-13, 11-15 on 2nd to 5th whorl respectively; base without axial sculpture. Spiral sculpture of narrow cords numbering 2, 3-4, 3-4 on second to fourth whorl, 10-12 on last whorl, including secondary spirals. Whorls rounded, angular at main spirals, constricted near deeply impressed suture. *Aperture* small, oval, ending abapically in short but distinct siphonal canal. *Columella* short, with one strong fold and a very weak one at the start of the siphonal canal, which is slightly inclined adaxially. Outer lip crenulate; no lirae inside. Siphonal fasciole slightly developed. No umbilicus, only a slight, completely closed, depression. Almost no columellar callus. Thin pale fawn periostracum.

Dimensions: holotype 9.9 x 5.8 mm. Paratypes 7.6 x 4.6 mm (MNHN); 5.6 x 3.6 mm (POLIPI).

REMARKS. — The constricted profile of the whorls resembles that of *M. metivieri*, but the latter species has much broader ribs. The sculpture somewhat resembles that of *Cancellaria patricia* Thiele, 1925, from East Africa (type locality) and south-eastern Australia (VERHECKEN, 1991b), but that species has much weaker columellar

folds and a shorter spire. *M. recessa* has a reticulated sculpture much stronger than in *M. karubar*, moreover it has two columellar folds of about the same strength, a small and narrow umbilicus, partly covered by callus, and a fine bristly greenish-brown periostracum (GARRARD, 1975: 37).

ETYMOLOGY. — This species is named after the French-Indonesian scientific expedition that discovered it.

*Microsveltia metivieri* sp. nov.

Figs 40-42

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 1 dd.

TYPE MATERIAL. — Holotype dd, MNHN.

TYPE LOCALITY. — **Indonesia**. Off Kai Islands, KARUBAR, stn DW 28, 05°31'S, 132°54'E, 448-467 m.

DESCRIPTION. — *Shell* small, white, with acuminate spire, spire angle 55°, and strongly constricted suture. *Protoconch* (Figs 41-42) white, paucispiral with one whorl, slightly deviating from teleoconch axis, nucleus relatively large, diameter 0.3 mm, suture slightly impressed. Maximum diameter 0.6 mm, exposed height 0.5 mm. Transition to teleoconch rather indistinct. *Teleoconch* with 4 3/4 whorls. Axial sculpture consisting of strong, broad rounded ribs, far less prominent near suture, numbering 8, 8, 9, 11 on 1st to 4th whorl respectively, 12 on last whorl. Growth lines microscopic, hardly visible. Spiral sculpture of well-marked cords, width up to 0.1 mm, numbering 2, 2, 3, 5 on 1st to 4th teleoconch whorl respectively, 11 on last whorl. The spirals keep their profile when crossing over the axials, without nodular intersection. Spiral cords more closely set in adapical two-third of whorls, thus giving the impression of a slightly excavated suture, but in younger whorls a much narrower spiral cord appears just above abapical suture. Last whorl regularly convex; axial sculpture disappearing towards umbilicus. *Aperture* rounded, columella straight, inclined adaxially, with two weak folds, anterior one weaker. Siphonal fasciole well developed, enclosing a narrow umbilicus which is almost closed by a thin columellar callus. No lirae inside outer lip. Short, broad siphonal canal.

Dimensions: 6.3 x 3.8 mm.

REMARKS. — The sculpture of strong ribs of *M. metivieri* superficially resembles the much stronger sculpture of *Scalptia mercadoi* Old, 1968, from the Philippines, but that species has a multispiral protoconch and grows up to 34 mm (AV) for 6 teleoconch whorls, or 18 mm for 4.5 whorls. *M. metivieri* is rather close to, but different from *M. recessa* Iredale, 1925, from New South Wales, Australia, which has bicarinate whorls with nodules on intersections of coarse spiral and axial sculpture, "microscopic hair-like growth lines", and 8 lirations inside outer lip (GARRARD, 1975: 37).

ETYMOLOGY. — This species is named in honour of Bernard MÉTIVIER (MNHN).

*Microsveltia procerula* sp. nov.

Figs 43-46

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 71, 08°38'S, 131°44'E, 477-480 m, 2 lv.

TYPE MATERIAL. — Holotype lv and 1 paratype lv, MNHN.

TYPE LOCALITY. — **Indonesia**. Off Tanimbar Islands, KARUBAR, stn CP 71, 08°38'S, 131°44'E, 477-480 m.

DESCRIPTION. — *Shell* small, high-spined, thin-walled, younger whorls translucent. *Protoconch* (Figs 43-44) paucispiral, bulbous, with about one smooth slightly oblique whorl, suture impressed, maximum diameter

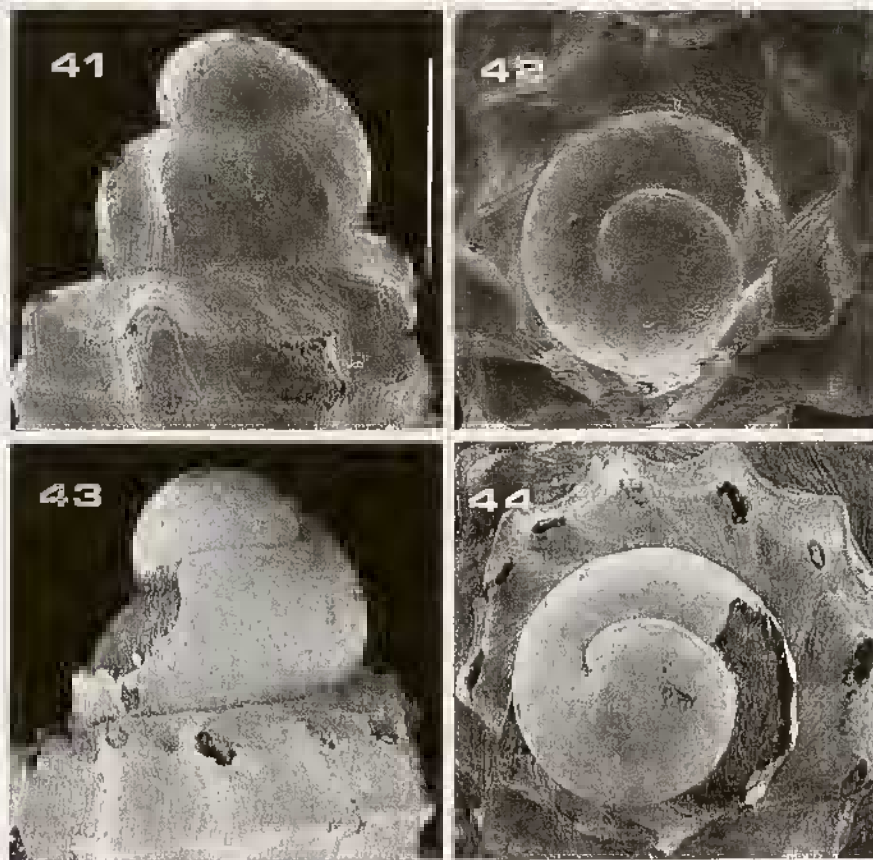


0.7 mm, exposed height 0.6 mm. Transition to teleoconch not discernible because of shell damage in that area. *Teleoconch* with about 4 whorls. Axial sculpture consists of rather narrow, slightly opisthocline rounded ribs, 12, 11, 10 and 11 on 1st to 4th whorl respectively. Spiral sculpture of narrow threads, 2, 3, 3 + 1 secondary, on 1st to 3rd whorl, 10 on last whorl, crossing over axials without nodules. *Aperture* rounded, trapeziform, with short, wide siphonal canal; outer lip thin, without inner lirae. Columella short, parallel to shell axis. One very weak columellar fold in holotype (Fig. 45); paratype (Fig. 46) with a relatively strong fold, and a weak one at rim of siphonal canal which deviates adaxially from the columellar direction. No umbilicus, no columellar callus. Siphonal fasciole not developed. Shell covered by thin pale-beige periostracum, forming microscopic axial folds which apparently do not reflect the presence of a similar sculpture on shell surface.

Dimensions: holotype 5.0 x 2.6 mm; paratype 6.0 x 3.0 mm.

REMARKS. — *Microsveltia procerula* is close to *M. cf. sagamiensis*, but differs by its thin shell, its less constricted suture, its sutural area sloping down towards shoulder of whorl, and its stronger columellar folds. It differs from *M. metivieri* in its less conical spire, and the strength and form of its axial ribs. *M. procerula* closely resembles *Cancellaria turriculata* Tate, 1889, from the upper Eocene of South Australia, judging from the original description and illustration (TATE, 1889: 156, pl. X, fig. 14), but conspecificity can be excluded because of the very large gap in time.

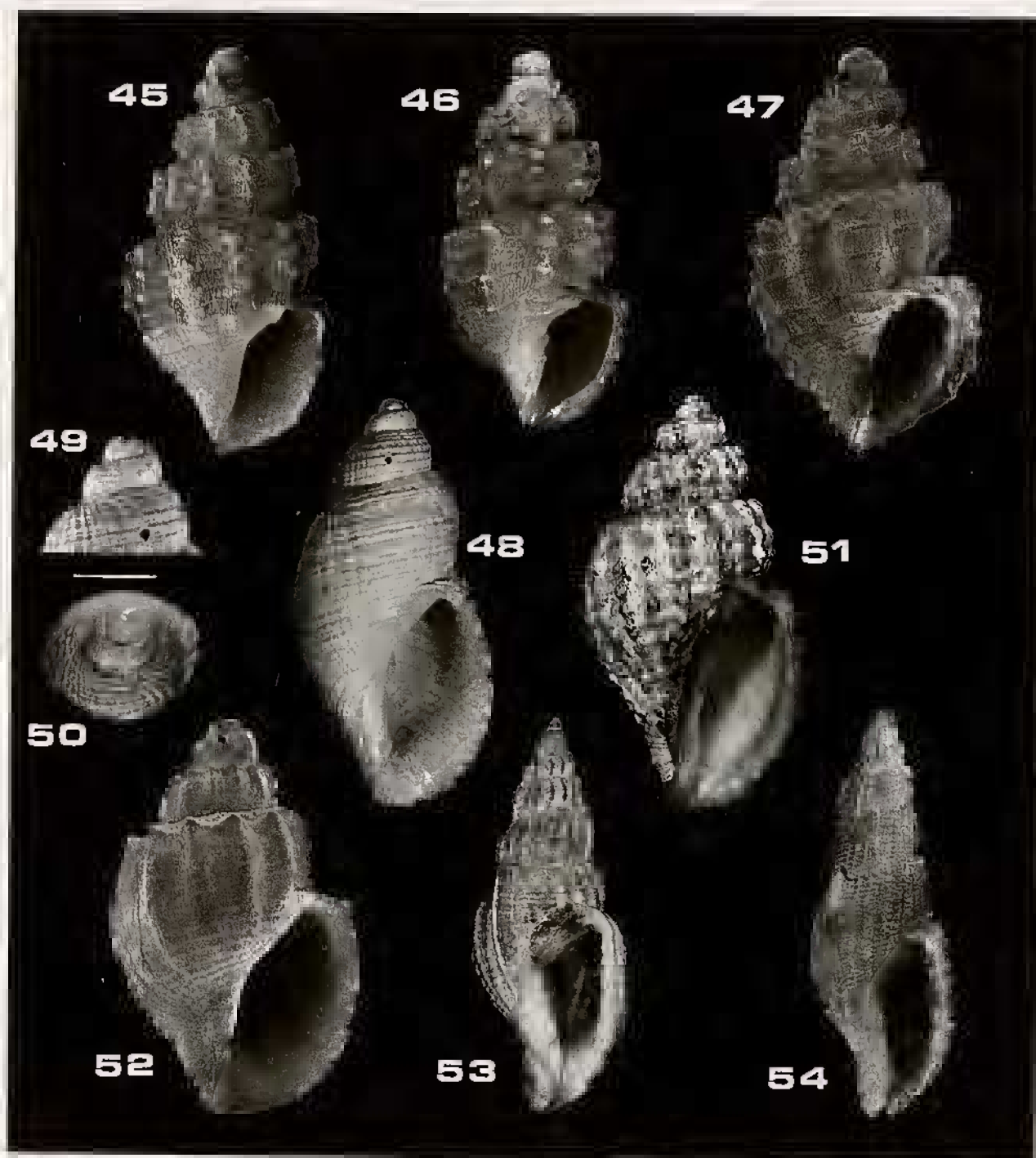
ETYMOLOGY. — The specific name is from the Latin adjective *procerulus*, diminutive of *procerus*, meaning "rather long, elongate", and refers to the slender form of this small shell.



FIGS 41-42. — *Microsveltia metivieri* sp. nov., holotype, protoconch.

FIGS 43-44. — *Microsveltia procerula*, holotype, protoconch.

Scale bar: 0.5 mm for all figures.



FIGS 45-46. — *Microsveltia procerula* sp. nov.: 45, holotype, 5.0 mm; 46, paratype, 6.0 mm, stn CP 71, 477-480 m.  
 FIG. 47. — *Microsveltia* cf. *sagantiensis* (Kuroda & Habe), 4.3 mm, stn DW 44, 291-295 m.  
 FIGS 48-50. — *Perplicaria boucheti* sp. nov.: 48, holotype, 9.0 mm; 49-50, protoconch. Scale bar: 1 mm.  
 FIG. 51. — *Solatia arafurensis* sp. nov., holotype, 36.0 mm.  
 FIG. 52. — *?Admete aethiopica* Thiele, 5.2 mm, stn CP 71, 477-480 m.  
 FIG. 53. — *Plesiotriton vivus* Habe & Okutani, 40.3 mm, stn DW 44, 291-295 m.  
 FIG. 54. — *Tritonoharpa beui* sp. nov., holotype, 16.5 mm.

*Microsveltia* cf. *sagamiensis* (Kuroda & Habe, 1971)

Figs 47, 55-57

*Neadmete sagamiensis* Kuroda & Habe in KURODA, HABE & OYAMA, 1971: 204, pl. 109, fig. 24.

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Taninbar Islands*: sin DW 44, 07°52'S, 132°48'E, 291-295 m, 1 dd.

TYPE MATERIAL. — The illustrated syntype of *Neadmete sagamiensis* (6.3 x 3.3 mm) is here designated lectotype; it is in the collection of the Emperor of Japan, together with at least 3 paralectotypes (not seen).

TYPE LOCALITY. — West of Jogashima, Sagami Bay, Japan, 110-150 m.

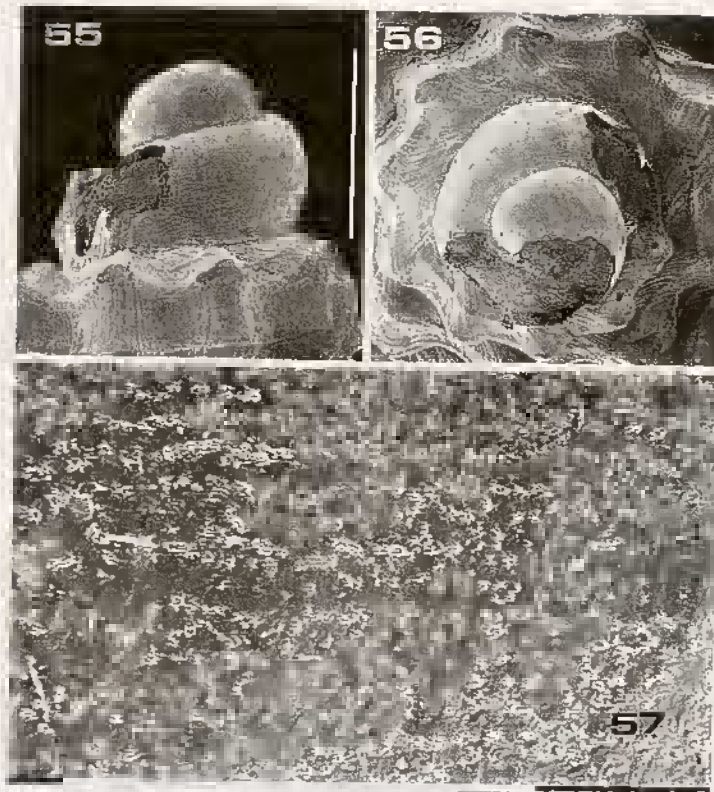
DISTRIBUTION. — Japan: from Sagami Bay, Honshu and Tosa Bay, Shikoku, sandy bottom, 50-200 m.

DESCRIPTION. — *Shell* minute, solid, elongated, spire angle 50°, constricted near suture, aperture small. *Protoconch* bulbous, paucispiral with about 1 whorl, suture impressed (Figs 55-56). Maximum diameter about 0.6 mm, exposed height 0.5 mm. Remains of a finely granular microsculpture still present (Fig. 57). Transition to *teleoconch* not discernible because of shell damage in that area. *Teleoconch* with about 3.5 shouldered whorls. Axial sculpture of rounded ribs, narrow on first, broadly rounded on later whorls, 10, 9 and 10 on 1st to 3rd *teleoconch* whorl, 7 on last whorl. Spiral sculpture of narrow (up to 0.1 mm wide) cords running over the axial ribs without forming nodules, 2 cords on 1st whorl, 2 + 1 secondary spiral and 1 on shoulder plane on 2nd whorl, 3 + 2 on shoulder plane on 3rd whorl. The zone between suture and the first adapical spiral cord is wider than the spiral interspaces. Last whorl with 11 narrow, well-marked spiral cords. Suture strongly constricted, sutural area almost horizontal and slightly wavy because of vanishing axial ribs; shoulder of axial ribs produced in a rounded angle. *Aperture* small, rounded triangular. Outer lip with thin edge (partly broken) and 5 widely spaced rather indistinct inner lirae continuing deep inside aperture. Columella straight, with 2 very weak folds deep inside aperture. Short, broad siphonal canal. Columellar callus narrow and thin, but covering most of the umbilical slit. Almost no siphonal fasciole. No periostracum.

Dimensions (KARUBAR specimen): 4.25 x 2.5 mm.

REMARKS. — PETIT (1974: 111) considered *Neadmete sagamiensis* to be a synonym of *Admete cancellata* Kobelt, 1887, described from Japan, and said to have 'narrow high radial ribs', narrower than their interspaces, and crossed by spirals of about the same strength, forming a neatly quadratic cancellation (KOBELT, 1887a: 12; 1887b: 105). KOBELT's illustration (1887b: pl. 24, fig. 14) is so small that it can hardly be used for identification, but the sculpture described is very obvious on the type [holotype by monotypy, ICZN art. 73a(ii), see KOBELT, 1887b: 10.2 x 6.2 mm, ZMHU 101677, Fig. 63]. The dimensions of the holotype and of its paucispiral protoconch (1 1/8 whorl, max. diameter 0.95 mm, exposed height 0.8 mm) are significantly larger than in the present material; and the sculpture is quite different, so that identification of the KARUBAR shell as *A. cancellata* is rejected. Both the KARUBAR shell and the lectotype of *Neadmete sagamiensis* (according to the original illustration) have axial ribs broader than their interspaces and much stronger than the spirals, and the whorls are more shouldered than the regularly rounded whorls of *A. cancellata*. Therefore, PETIT's identification of *N. sagamiensis* as *Admete cancellata* does not seem completely warranted, but variability within these taxa is as yet unknown. Since the present specimen is certainly different from the holotype of *A. cancellata* and closest to *M. sagamiensis*, the latter name is used here. The KARUBAR specimen differs from the lectotype of *N. sagamiensis* in having the whorls more shouldered and the aperture more triangular. The protoconch of the lectotype, according to KURODA & HABE's description and illustration, is larger and has more whorls. Because of these differences, identification of the present material is only tentative. *M. cf. sagamiensis* is quite similar to *M. metivieri* but differs in having the whorls more shouldered, a wider and flatter sutural area, the axial ribs less pronounced, the whorls less convex, and the columellar folds much weaker.





FIGS 55-57. — *Microsveltia* cf. *sagamiensis* (Kuroda & Habe): 55-56, protoconch, stn DW 44, 291-295 m. Scale bar: 0.5 mm; 57, detail of protoconch sculpture. Scale bar: 0.1 mm.

Published illustrations of *M. recessa* from New South Wales, Australia are somewhat contradictory, drawings of the holotype (IREDALE, 1925: pl. 43, fig. 16; LASERON, 1955: 268, fig. 11) resembling the present shell except for the 2 strong columellar folds, but photographs of the holotype [GARRARD, 1975: fig. 3(8)] and other specimens [GARRARD, 1975: fig. 3(7); KAICHER, 1978: card 1919] showing a very coarse quadratic sculpture. *M. recessa* has two bold and narrow spiral cords, forming prominent lateral nodules at junction with ribs, and strong lirations inside the outer lip (GARRARD, 1975: 37). In general form and in the sculpture of broad axial ribs overridden by narrow spiral bands, *M. sagamiensis* seems also to be close to *Cancellaria japonica* Smith, 1879, but extensive damage to the latter's holotype (11.9 x 5.8 mm, BMNH 1878.11.7.90, figured by PETIT, 1974: 110, text-fig. 3) prevents clear conclusions. Subsequent to the original description, no additional specimens of *C. japonica* have been reported; it could not be recognised as any known Japanese species by HABE and by OKUTANI (PETIT, 1974: 110). Hence, its real relation to *M. sagamiensis* remains unclear.

KURODA & HABE (1971) placed *sagamiensis* in the genus *Neadmete* Habe, 1961. Its type species (ICZN Opinion 1370), *N. okutanii* Petit, 1974, has a dominantly spiral sculpture (see HABE, 1961: pl. 23, fig. 11, incorrectly identified as *Neadmete japonica*, later renamed *N. okutanii*). The genus has been used for several rather large, cold-water species from the northeastern Pacific (KANAKOFF & MCLEAN, 1966; ABBOTT, 1974: 248) with a dominantly spiral sculpture. Hence, I prefer not to use this genus for the present species in which the axials dominate.

#### Genus *PERPLICARIA* Dall, 1890

*Perplicaria* Dall, 1890: 90. Type species (by monotypy): *Perplicaria perplexa* Dall, 1890. Pliocene, Florida, USA.  
 Synonym: *Daguinia* Magne, 1966: 127, fig. 1. Type species (by monotypy): *Daguinia vigneauxi* Magne, 1966. Miocene, France.



*Perplicaria* has been known only from five fossil species in the Caribbean and France, and one Recent species (*Perplicaria clarki* M. Smith, 1947) from West Central America. The genus ranges from the early Miocene (*Perplicaria prior* Maury, 1910) to Recent.

*Perplicaria boucheti* sp. nov.

Figs 48-50

MATERIAL EXAMINED. — Indonesia. KARUBAR, Tanimbar Islands: stn CP 79, 09°16'S, 131°22'E, 239-250 m, 1 dd.

TYPE MATERIAL. — Holotype dd, MNHN.

TYPE LOCALITY. — Indonesia. Tanimbar Islands, KARUBAR, stn CP 79, 09°16'S, 131°22'E, 239-250 m.

DESCRIPTION. — *Shell* outline typical for a *Perplicaria*. *Protoconch* whitish, paucispiral with one rapidly expanding whorl (Figs 49-50), maximum diameter 0.9 mm, exposed height 0.8 mm. Surface smooth and shiny, last 1/16 whorl showing a smoothly indicated start of spiral sculpture. Transition to teleoconch clearly marked by an expansion of shell width and the beginning of strong teleoconch sculpture. *Teleoconch* with 2 3/4 whorls, rapidly expanding in height. On first half whorl only spiral sculpture of 7 low flat bands. On second whorl 36 gently indicated axial ribs, and 11 primary spiral cords, with one narrower second order spiral in between. Last whorl with 19 broad spiral cords, second and third order spirals in between. On last whorl, axial ribs have practically disappeared. Axial ribs and growth lines opisthocyrte. Whorls rounded, suture impressed. Inclination of whorls steeper than inclination of spiral bands. *Aperture* oblong, 54 % of total shell height, slightly expanded abapically. Outer lip solid, with narrow and slightly crenulated edge, 15 lirae inside. Columella straight, with 3 folds, adapical one strongest, abapical fold forming rim of short siphonal canal. No umbilicus, only a very narrow slit is present. Columellar callus thin, almost completely covering the umbilical slit. Colour pale fawn, inside of aperture white, with an indistinct colabral pale orange band near base of lirae.

Dimensions: 9.0 x 4.5 mm.

REMARKS. — *P. boucheti* represents the first *Perplicaria* known from the Eastern hemisphere, and the second known living species of the genus. *Perplicaria clarki* differs in having a multispiral protoconch (as ascertained based on a shell from Gobernadora Island, Panama, AMNH 253840), and adult size reaching 33 mm (KEEN, 1971: 656). Based on analogy with the other species of this genus, the holotype of *P. boucheti* may not be fully grown.

ETYMOLOGY. — This species is named in honour of Philippe BOUCHET (MNHN).

Genus *SOLATIA* Jousseaume, 1887

*Solatia* Jousseaume, 1887: 222. Type species (OD): *Solatia solat* Jousseaume, 1887 (junior subjective synonym of *Solatia piscatoria* Gmelin, 1789. See VERHECKEN, 1988: 665), North-west Africa.

This genus groups mainly European fossil and two Recent species in the eastern Atlantic (VERHECKEN, 1988). Only *Solatia buccinoides* (Sowerby, 1832) from tropical West America has also been placed in *Solatia* (KEEN, 1971: 654), but this placement is questionable.

*Solatia arafurensis* sp. nov.

Fig. 51

*Cancellaria* sp. - WILSON, 1994: 175, pl. 37, fig. 19.

MATERIAL EXAMINED. — Indonesia. KARUBAR, Tanimbar Islands: stn CP 72, 08°36'S, 131°33'E, 676-699 m, 1 lv.

TYPE MATERIAL. — Holotype *lv*, MNHN.

TYPE LOCALITY. — Indonesia. Off Tanimbar Islands, KARUBAR, stn CP 72, 08°36'S, 131°33'E, 676-699 m.

DISTRIBUTION. — Type locality, and off Port Hedland, north Western Australia (WILSON, 1994; material not examined).

DESCRIPTION. — *Shell* large, solid, oblong, strongly sculptured; last whorl elongated. *Protoconch* missing, early *teleoconch* whorls strongly corroded. *Teleoconch* axial sculpture of strong, broad rounded ribs, interspaces about as wide as ribs, 13, 15, 16 on spire whorls, 16 on last whorl. Spiral sculpture of broad rounded cords, smoothly indicated, 4 per whorl, plus one on shoulder of whorl, fused onto nearest cord. Intersection with axials strongly nodular. Suture impressed, forming a narrow concave sutural area, bordered by strong nodules on shoulder of ribs and obliquely crossed by strong growth lines. *Aperture* white, oblong, ending apically in a well-defined siphonal canal. *Columella* straight, parallel to shell axis, two rather strong columellar folds placed near half height. *Columellar callus* thin, transparent, covering almost completely narrow umbilical slit. *Outer lip* slightly crenulated, no lirae inside.

Dimensions: 36.0 x 20.1 mm.

REMARKS. — Except for two recently formed sections of the last whorl, the shell surface is heavily corroded and chalky. In spite of this, aperture interior is intact and smooth, and the specimen was live-taken. Large parts of the shell surface were covered by a black layer (about 0.5 mm thick, still partly visible on Fig. 51) with the aspect of bitumen, which however does not dissolve in acetone or dichloromethane, usual solvents for bituminous substances. It might be periostracum, or remains of an epibiont. The last section of the last whorl, where shell dissolution must have been minimal, had very little of this layer: this seems to point out an epibiont rather than periostracum.

This species is close only to *Solatia buccinoides* (Sowerby, 1832) from tropical West America, which grows up to 40 mm, has a brown shell, much stronger spiral sculpture, and sutural area sloping down towards shoulder. *S. buccinoides* also has a wider aperture, the outer lip expanded near half height with 11 lirae inside, and a posterior canal. The two columellar folds are stronger than in *S. arafurensis*. Placement of this new species in *Solatia* is by reference to *S. buccinoides*, since there seems to be no better fitting genus.

This is clearly the species mentioned and illustrated by WILSON (1994), who gives the following information: "4 cm. North West Shelf. This unidentified species has been trawled recently on the scampi grounds on the outer edge of the continental shelf off Port Hedland".

ETYMOLOGY. — Named after the Arafura Sea, where the holotype was collected.

Subfamily ADMETINAE Troschel, 1856

Genus *ADMETE* Krøyer in Möller, 1842

*Admete* Krøyer in Möller, 1842: 88. Type species (by monotypy): *Admete crispa* Möller, 1842 (= *Tritonium viridulum* Fabricius, 1780). North Atlantic.

Species of *Admete* typically occur at high latitudes or in deep water.

?*Admete aethiopica* Thiele, 1925

Figs 52, 58-59

*Admete aethiopica* Thiele, 1925: 201, pl. 22, fig. 23.

MATERIAL EXAMINED. — **Somalia.** The type material (see hereafter).

**Indonesia.** KARUBAR, *Tanimbar Islands*; stn CP 71, 08°38'S, 131°44'E, 477-480 m, 1 *lv*.

**TYPE MATERIAL.** — Lectotype, here designated, the shell figured by THIELE, 3.7 x 2.4 mm. Paralectotypes: 10 specimens, "*Valdivia*", stn 251, 01°40.6'S, 41°47.1'E, 693 m, and 2 specimens, "*Valdivia*", stn 256, 01°49'N, 45°29.5'S, 1134 m. All types are in ZMHU; no registration number. Paralectotype 10 (3.5 x 2.0 mm, lv) is quite different and resembles the turrid *Propebela exarata* (Möller, 1842) from Greenland, as illustrated by SNELI & STOKLAND (1986: 122, fig. 2).

**TYPE LOCALITY.** — Eastern Africa. Off Somalia, "*Valdivia*", stn 251, 01°40.6'S, 41°47.1'E, 693 m.

**DISTRIBUTION.** — Off Somalia, 693-1134 m; now the Arafura Sea, 480 m.

**DESCRIPTION.** — [KARUBAR specimen] *Shell* small, thin-walled, semi-translucent, whitish; spire short. *Protoconch* smooth, paucispiral, with about 1 1/8 whorl, maximum diameter 0.7 mm, exposed height 0.5 mm (Figs 58-59). Nucleus relatively large, diameter 0.26 mm. Transition to teleoconch only marked by start of axial teleoconch sculpture. *Teleoconch* with 3 slightly inflated whorls, suture impressed, last whorl large, height 4.0 mm (77 % of total shell height). Axial sculpture on 1st to 3rd whorl consisting of respectively 13, 12, 12 smoothly indicated, slightly sigmoid rounded ribs, disappearing near shell base. One rather strong spiral cord on shoulder, forming nodular intersection with axials, adjacent to somewhat concave spiral depression. Smooth spiral bands, width 0.1 mm, numbering 6 on 2nd, 14 on last whorl, separated by narrow groove, crowded towards shell periphery and base. Shoulder area flat, slightly sloping down towards shoulder cord, axials obliquely crossing over it. Aperture oval, slightly square-cut adapically. Columella straight, almost parallel to shell axis, with 2 very weak folds near half height; siphonal canal wide and short. Outer lip thin, translucent, no inner lirae. No umbilicus.

Dimensions: 5.2 x 3.4 mm.

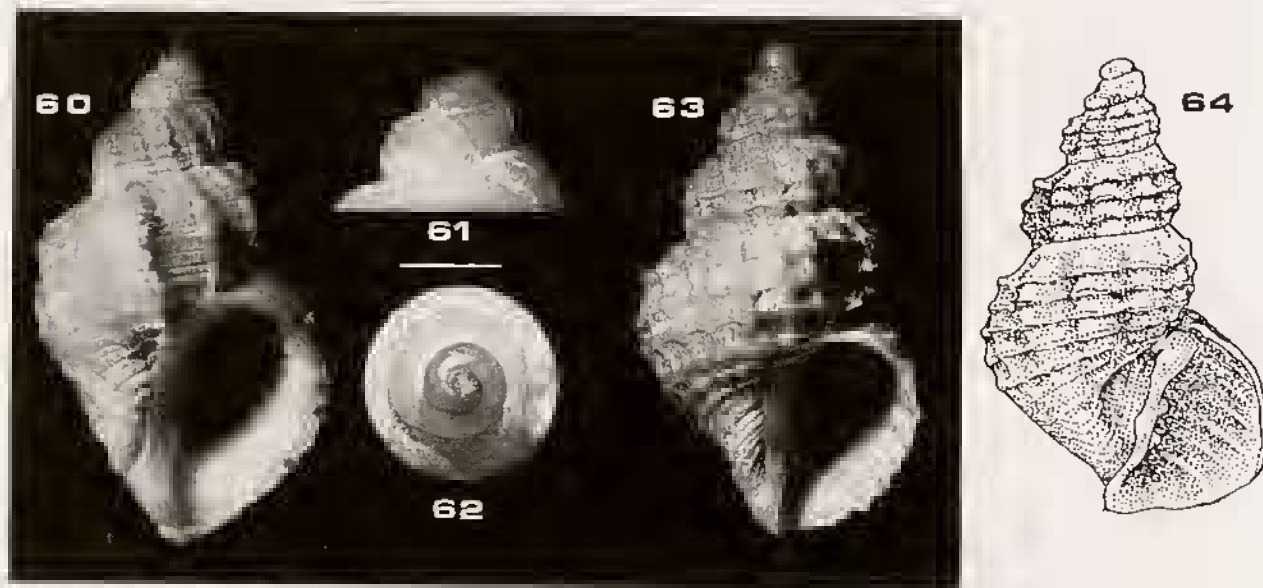


FIGS 58-59. — ?*Admete aethiopica* Thiele, sin CP 71, 477-480 m, protoconch. Scale bar: 0.5 mm.

**REMARKS.** — The lectotype of *Admete aethiopica* has a dome-shaped paucispiral protoconch of 1 whorl, maximum diameter 0.7 mm, exposed height 0.6 mm, nucleus large, diameter 0.33 mm. The teleoconch has 2.5 whorls, axial ribs 15 and 16 on 1st and 2nd whorl, 13 on last whorl; 13 spirals on apertural side of last whorl. Height of aperture 1.9 mm, height of last whorl 3.0 mm. Paralectotypes measure up to 4.4 x 2.7 mm (THIELE gave 4.25 x 2.5 mm), average 3.8 x 2.3 mm. The double row of nodules near shoulder, as figured by THIELE, is only clearly present in the five largest shells, and can be even stronger than in the lectotype. It may be a characteristic of fully grown specimens. The Indonesian specimen, although larger than any of the types, has the second row only vaguely indicated and has fewer axial ribs than the lectotype. The number of axial ribs in the type material (excluding paralectotype 10) is 14-16 and 15-16 on the 1st and 2nd teleoconch whorls respectively. The obtusely angled truncated columella figured by THIELE occurs in most, but not all of the paralectotypes. Also the

strength of the spiral striae is quite variable. Considering all this, and despite the geographic distance, there seems to be no reason to separate the East African material and the present Indonesian material.

Subsequent to its original description, *Admete aethiopica* has been mentioned only by PETIT & HARASEWYCH (1990: 9), stating that *Admete aethiopica* is "not a cancellariid". This statement was based on a verbal communication by P. BOUCHET in 1984 (PETIT, *in litt.*, June 1995), who considered THIELE's species to be a juvenile *Gymnobela* at that time. BOUCHET (*in litt.*, July 1995) now admits that his 1984 opinion was erroneous and that *Admete aethiopica* is a cancellariid. Placement of the species in *Admete* is not certain, but seems the most appropriate for the time being. THIELE found no radula, and I equally found neither radula nor tubular jaw. Two perfectly spherical glassy statocysts, diameter 0.1 mm, could be seen by transparency after rehydrating the animal prior to dissection.



FIGS 60-64. — Japanese cancellariids. 60-62, *Axelella nodosivaricosa* (Petuch): 60, 15.9 mm, Yaku Island, 130 m; 61-62, protoconch, scale bar: 1 mm. — 63, *Admete cancellata* Kobelt, holotype (ZMHU 101677), 10.2 mm. — 64, *Solutosveltia abyssicola* Habe, enlarged reproduction of HABE, 1961: pl. 23, fig. 4.

#### Subfamily PLESIOTRITONINAE Beu & Maxwell, 1987

##### Genus *PLESIOTRITON* Fischer, 1884

*Plesiotriton* Fischer, 1884: 654. Type species (OD): *Cancellaria volutella* Lamarck, 1803. Eocene, France.

Range of the genus: Upper Cretaceous to Recent. Only two Recent species are known: the Indo-Pacific *P. vivus* Habe & Okutani, 1981, and the Pacific *P. mirabilis* Beu & Maxwell, 1987.

##### *Plesiotriton vivus* Habe & Okutani, 1981

Fig. 53

*Plesiotriton vivus* Habe & Okutani, 1981: 144, figs 2-3. — BEU & MAXWELL, 1987: 28, fig. 2D, pl. 4 f, i, m.  
*Pisanella viva* - SPRINGSTEEN & LEOBRERA, 1986: 98, pl. 18, fig. 25.

MATERIAL EXAMINED. — Indonesia, KARUBAR, Tanimbar Islands: stn DW 44, 07°52'S, 132°48'E, 291-295 m, 1 dd.



TYPE MATERIAL. — Holotype (39.0 x 15.2 mm), NSMT-Mo 58602. Two paratypes NSMT-Mo 58603-4.

TYPE LOCALITY. — Philippines. Off Panglao, Bohol Island, deep water.

DISTRIBUTION. — Philippines, Indonesia, Zanzibar (BEU & MAXWELL, 1987: 28).

REMARKS. — The placement of this species in *Plesiotriton* was maintained with doubt by BEU & MAXWELL, who figured the protoconch (1987: 10, fig. 2D).

### Genus *TRITONOHARPA* Dall, 1908

*Tritonoharpa* Dall, 1908: 319. Type species (OD): *Tritonoharpa vexillata* Dall, 1908. Recent, Panamic Western America. Synonyms: *Nivitrion* Iredale, 1929, *Esbelta* Sarasua, 1975 (fide BEU & MAXWELL, 1987: 33).

*Tritonoharpa* differs from *Plesiotriton* in lacking the prominent columellar folds and (as far as presently known) a radula. BEU & MAXWELL (1987: 33) include 19 Recent species, most of them from the tropical Indo-West Pacific. Six species of *Tritonoharpa* are currently known from Indonesia (BEU & MAXWELL 1987), three of them still unnamed.

#### *Tritonoharpa beui* sp. nov.

Fig. 54

*Tritonoharpa* n. sp.?C, aff. *T. angasi* (Brazier) - BEU & MAXWELL 1987: 35, pls 12i-j, 1-p.

MATERIAL EXAMINED. — Indonesia. KARUBAR, Kai Islands: stn DW 30, 05°39'S, 132°56'E, 111-118 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype dd, MNHN. Paratype 22.4 x 7.4 mm, WAM 3043.83: MARIEL KING MEMORIAL EXPEDITION, Tanimbar Islands: stn TSIII:1-7, 6 miles west of Labuan Olendir, Selaru, 08°07'S, 130°51'E, 25-vi-1970, 46-64 m; (BEU & MAXWELL, 1987: 35; not seen).

TYPE LOCALITY. — Indonesia. Off Kai Islands, KARUBAR, stn DW 30, 05°39'S, 132°56'E, 111-118 m.

DISTRIBUTION. — Kai and Tanimbar Islands, southern Moluccas, Indonesia.

DESCRIPTION. — *Shell* elongate, axial sculpture slightly more prominent than spiral sculpture; aperture long (45% of total shell length) and rather narrow. *Protoconch* relatively large, slightly deviating from teleoconch axis, paucispiral with 1.5 swollen smooth whorls, not planorboid; maximum diameter 1.2 mm, exposed height 1.0 mm. Transition to teleoconch shell clearly marked by sudden start of teleoconch spiral sculpture. *Teleoconch* with 5.5 weakly convex whorls. Axial sculpture of narrow, low, opisthocline non-collabral ribs, 16, 17, 18, 25 on 1st to 4th teleoconch whorl, 25 on last whorl. Varices formed at irregular intervals (150°-360°) on spire whorls, spaced about 240° on adult whorls, not parallel to axial ribs, raised rather high above suture, which is coronated by axial ribs of the subsequent whorl. Varices reflected and concave on abapertural face. On base, fine growth lines present between axials. Spiral sculpture of flattened narrow cords, 0.1 mm wide, 8, 8, 8, 10, 10 on 1st to 5th whorl, 34 on last whorl. Three to 6 microscopic spiral lines in spiral interspaces. Spirals form tiny nodules when crossing axial ribs. *Aperture* forming a rounded elongated parallelogram, ending adapically in a small sinus. Outer lip smooth inside, edge crenulated with 16 small nodules, bordered at a distance of 0.5 mm by a strong varix. The same arrangement can also be seen on older varices, where further shell growth occurred not at the curled-up edge of outer lip, but somewhat inside it. Inner lip erect, extended into a well developed columellar collar. Columella almost parallel to shell axis, slightly swollen near centre but without a distinct fold. Siphonal canal well developed, open and strongly twisted dorsally. Umbilical chink partly hidden by anterior end of columellar collar. Background colour pale beige; a large brown blotch at mid-distance between two varices, and a

narrow brown band extending over the width of 3 spiral cords on varices, brown elements paler and indistinct on apical whorls.

Dimensions (holotype): 16.5 x 6.0 mm.

REMARKS. — A photograph of the KARUBAR specimen was submitted to A. BEU (NZGS), who advised that its presumed identity with *Tritonoharpa* n. sp. ?C, aff. *T. angasi* appears to be correct. BEU & MAXWELL (1987: 35) state that it "lacks the interstitial cords of *T. angasi*". This refers to the secondary spiral cords (BEU, *in litt.*) and these are indeed lacking on the holotype. The only difference between holotype and paratype is the slightly greater inflation of the whorls of the latter. The protoconch of the paratype was figured by BEU & MAXWELL (1987: pl. 12, fig. o).

Distinction of species within *Tritonoharpa* is not easy. *T. beui* differs from some of its congeners by its nearly straight-sided whorls and general shell outline, from others by its microscopic spiral sculpture or by the protoconch retained in adult specimens (several species are normally decollate at this size). For further differentiation from other species of *Tritonoharpa*, see BEU & MAXWELL (1987: 35).

ETYMOLOGY. — This species is named in honour of A. G. BEU (NZGS), senior author of the important study on Plesiotritoninae where this species was figured for the first time and was recognised as a probably new species.

## DISCUSSION

The present collection is remarkable in the number of new records and new taxa collected in the somewhat restricted geographical area covered by the expedition. From the Arafura Sea, only 7 cancellariids had been recorded in the literature and/or are represented in museum collections: the holotype of *Cancellaria nassoides* Schepman, 1911 [= *Bouellitia garrardi*] from the Kai Islands (ZMA); a specimen of *Trigonostoma bicolor* (Hinds, 1843) from "Samarang" stn 258, Tual, Kai Islands, 22 m (ZMA); a damaged specimen of *T. antiquatum* (Hinds, 1843) from approximately 100 miles North of Croker Island, Arafura Sea, 09°30' S, 132°34' E, 124 m (AMS); a specimen of *Neadmete okutanii* (identification by T. GARRARD) from off W. Aru Island, 54-65 m (USNM 747371); and three species of *Tritonoharpa*: *T. pseudangasi* Beu & Maxwell, *T. brunnea* Beu & Maxwell and *T. aff. angasi*, together represented by 5 specimens. The present material adds 18 additional species, only 3 of which are here well represented in number of specimens. The total number of cancellariid species known to occur in Indonesian seas is now 41 (VERHECKEN, 1986; BEU & MAXWELL, 1987; the present study). This compares favourably to other, much more thoroughly studied, (Indo-) Pacific areas: Australia 48, Philippines 16, Japan 36 species. Among the new species, some appear to have their closest relative in west central America and the Atlantic Ocean. Faunal affinities between Plio-Pleistocene molluscs from the latter areas and from western Pacific islands had already been reported (LADD, 1982: 19-20).

Another result of the present study is the presence of a shell layer, possibly an intritacalx, which has been noted in some, but not all species here placed in *Brocchinia*. Surface layers of this type had not yet been described in Cancellariidae. Further work will be necessary to evaluate the significance of this character at genus level.

## ACKNOWLEDGEMENTS

The material reported in this paper was collected by P. BOUCHET, W. KASTORO and B. MÉTIVIER, between 23 October and 3 November 1991, working on board the R/V "Baruna Jaya I" during the KARUBAR expedition. Thanks are due to P. BOUCHET (MNHN) for making this material available for study. J. CILLIS (KBIN) made the SEM-photographs. A. G. BEU (NZGS), R. KILIAS (ZMHU), R. G. MOOLENBEEK (ZMA), R. E. PETIT (North Myrtle Beach, South Carolina, USA) and K. M. WAY (BMNH) provided helpful information or sent material on loan. T. BACKELJAU (KBIN) read a draft of the manuscript.

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